Small Business Innovation Research/Small Business Tech Transfer

Solid Oxide Electrolysis for Oxygen Production in an ARS, Phase II

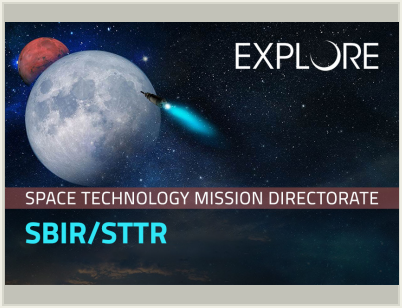
Completed Technology Project (2007 - 2009)

Project Introduction

Oxygen regenerated from a crew's expired CO2 and H2O vapor is essential to enabling a continuous human presence on the moon at significantly reduced costs and risks. Any such technology demonstrated on the moon will then be ready to support the transport of humans to Mars and their eventual surface exploration efforts. Paragon Space Development Corporation is proposing an innovative, efficient and practical concept that utilizes Solid Oxide Electrolysis (SOE) for the next generation electrolysis/Sabatier subsystem to enable 100% oxygen regenerative air revitalization systems (ARS). The concept is innovative because it safely eliminates handling of hydrogen, works irrespective of gravity and pressure environments with no moving parts and no multi-phase flows, and requires no expendables while being compact with minimal impact on mass. This innovation is directly relevant and essential to our current mandate set by the President to return humans to the moon and in doing so develop technologies that will enable our exploration of Mars. The significance of the proposed Phase 2 SOE development effort is that it offers the very real possibility that life support systems could close the oxygen loop such that oxygen supporting consumables required to produce oxygen need not continually be delivered from Earth.

Anticipated Benefits

Potential NASA Commercial Applications: Stand-alone SOE oxygen regeneration systems, like those proposed for an extraterrestrial base, could be placed in underwater research facilities, submarines, high altitude flying crafts or emergency bunkers in the event of terrorist attacks. Hazardous material handlers, rescue personnel or other professionals performing in extreme environments (i.e., EPA, DOD, Homeland Security, Mine Safety and Health Administration) would benefit greatly from a self-contained oxygen supply system that requires no supply of consumables. Finally, because SOE technology can dual as a fuel cell, spin-offs of the technology include power systems for regions or as relief systems during high energy-use periods of the day.



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

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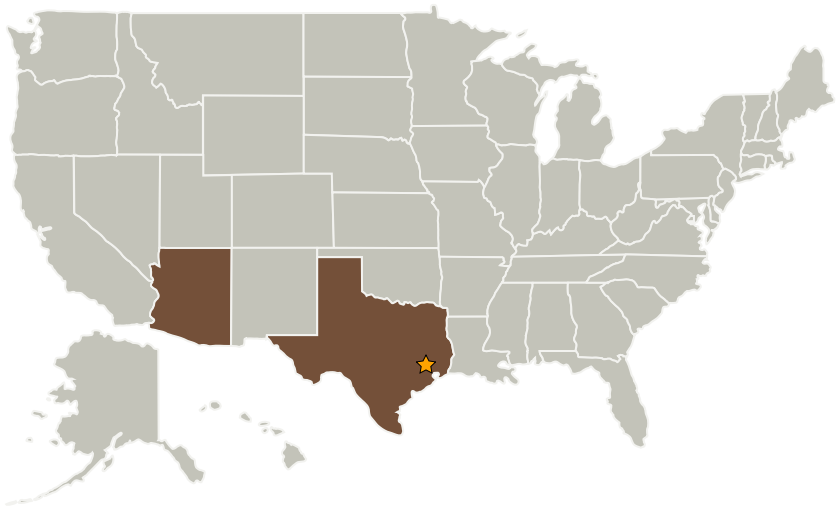
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Paragon Space Development Corporation	Supporting Organization	Industry	Tucson, Arizona

Primary U.S. Work Locations	
Arizona	Texas

Project Transitions

February 2007: Project Start

January 2009: Closed out

Closeout Summary: Solid Oxide Electrolysis for Oxygen Production in an ARS, Phase II Project Image

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Christine Iacomini

Technology Areas

Primary:

- TX07 Exploration Destination Systems
  - TX07.1 In-Situ Resource Utilization
    - TX07.1.3 Resource Processing for Production of Mission Consumables